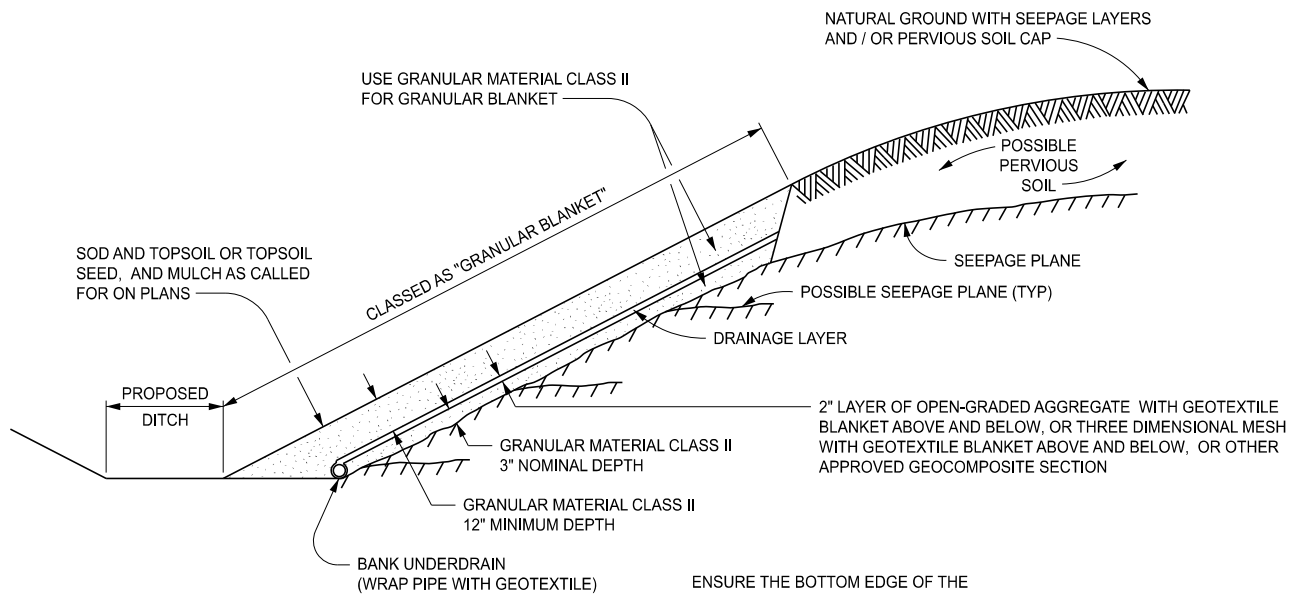
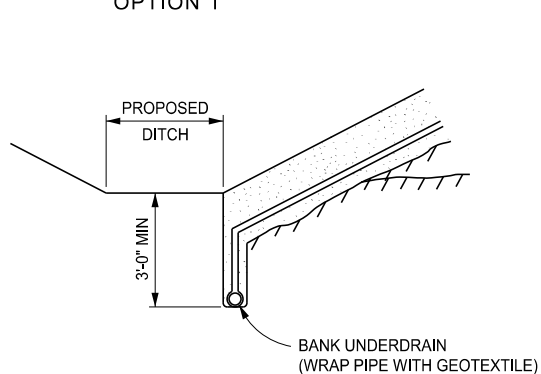


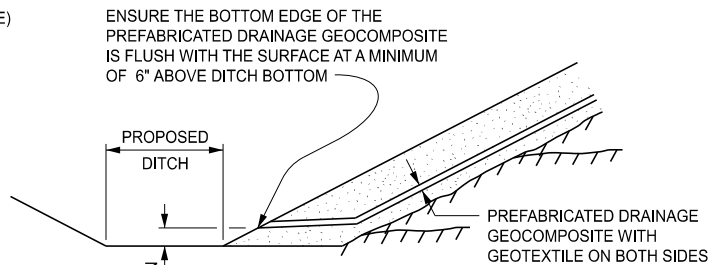
GRANULAR BLANKET TYPE 1



OPTION 1



OPTION 2



OPTION 3

NOTE: OPTION 1, 2, OR 3 WILL BE DETERMINED BY THE ENGINEER BASED ON THE PROJECT CONDITIONS.

GRANULAR BLANKET TYPE 2

APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: _____
DIRECTOR, BUREAU OF DEVELOPMENT



DEPARTMENT DIRECTOR
BRADLEY C. WIEFERICH, PE

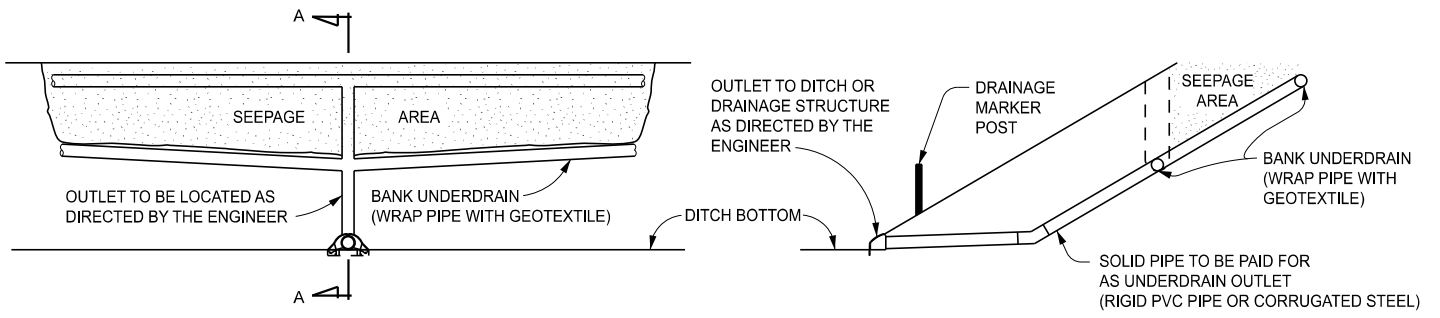
STANDARD PLAN FOR
GRANULAR BLANKET, UNDERDRAINS, OUTLET ENDINGS
FOR UNDERDRAINS, AND SEWER BULKHEADS

SPECIAL DETAIL
FHWA APPROVAL

02/05/2026
PLAN DATE

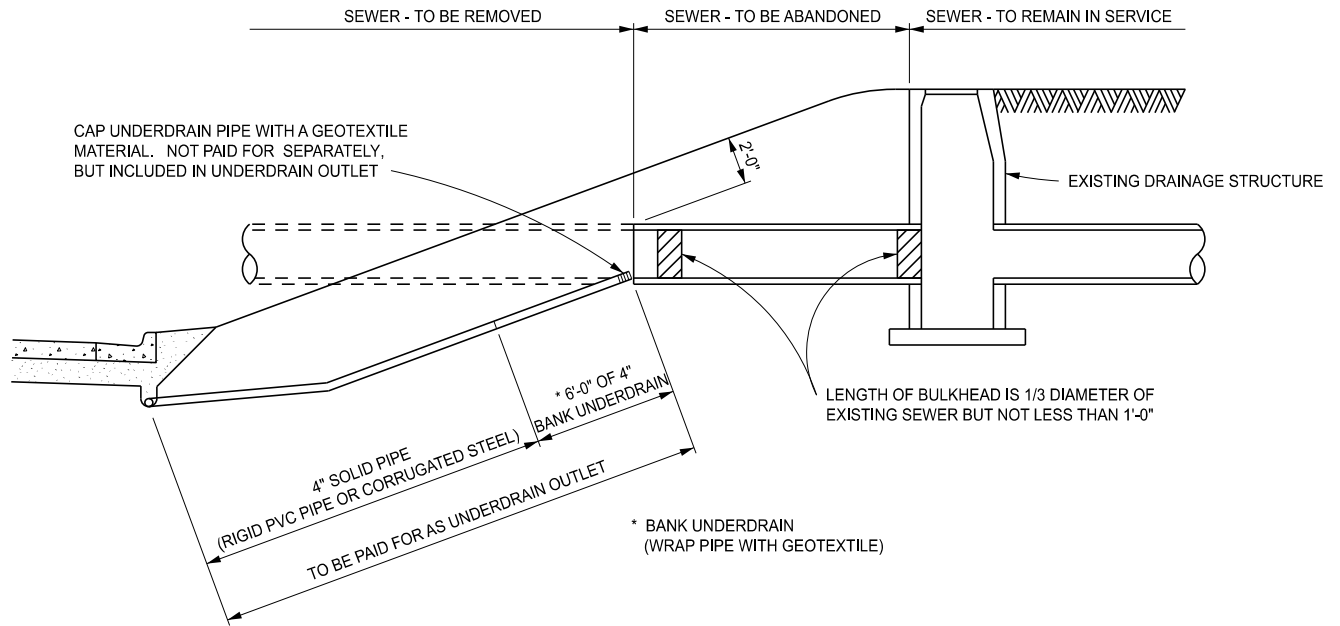
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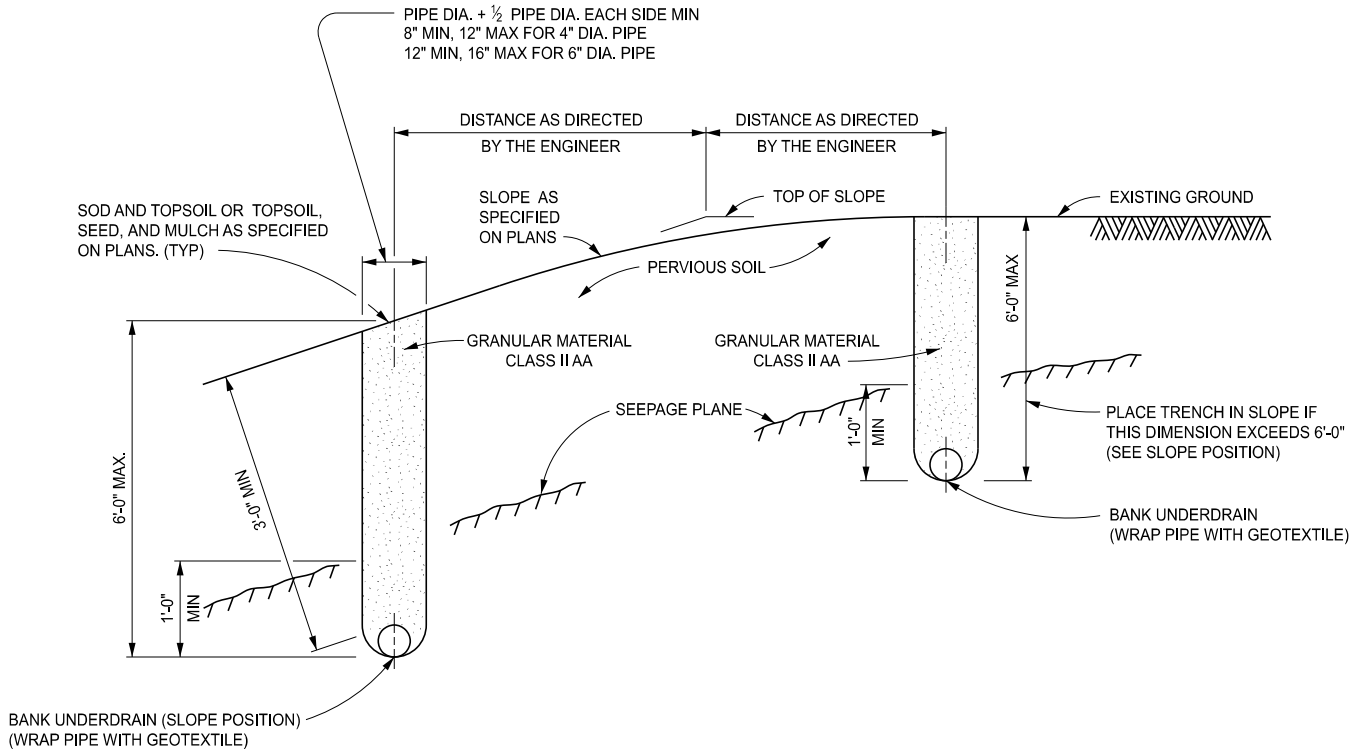
SECTION A - A

BANK UNDERDRAIN OUTLET

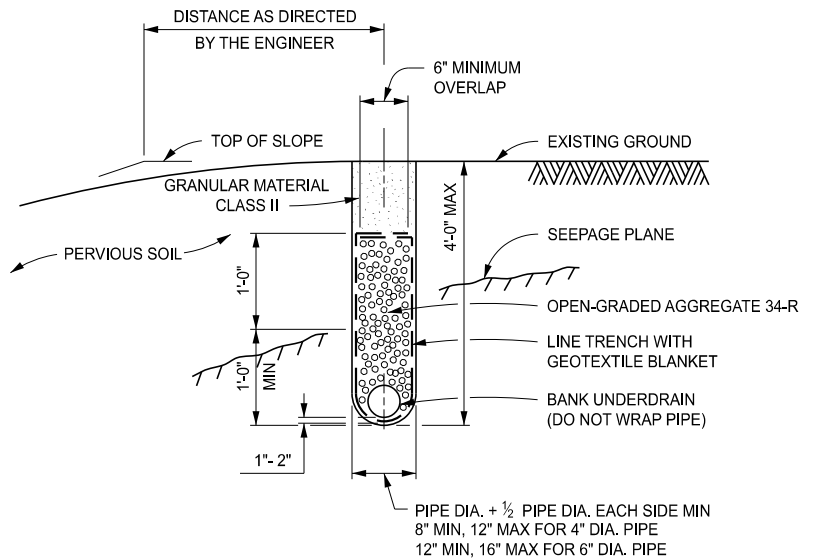


WEEPER UNDERDRAIN AND BULKHEADING SEVERED SEWER

<p>DEPARTMENT DIRECTOR BRADLEY C. WIEFERICH, PE</p>	STANDARD PLAN FOR GRANULAR BLANKET, UNDERDRAINS, OUTLET ENDINGS FOR UNDERDRAINS, AND SEWER BULKHEADS		R-80-F	SHEET 2 OF 9
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BANK UNDERDRAINS

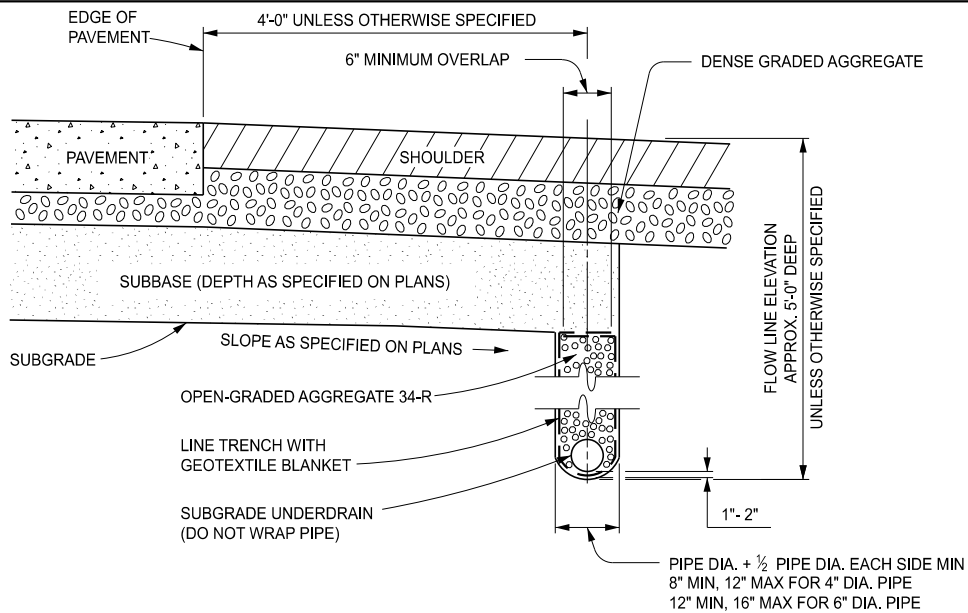


BANK UNDERDRAIN, OPEN-GRADED

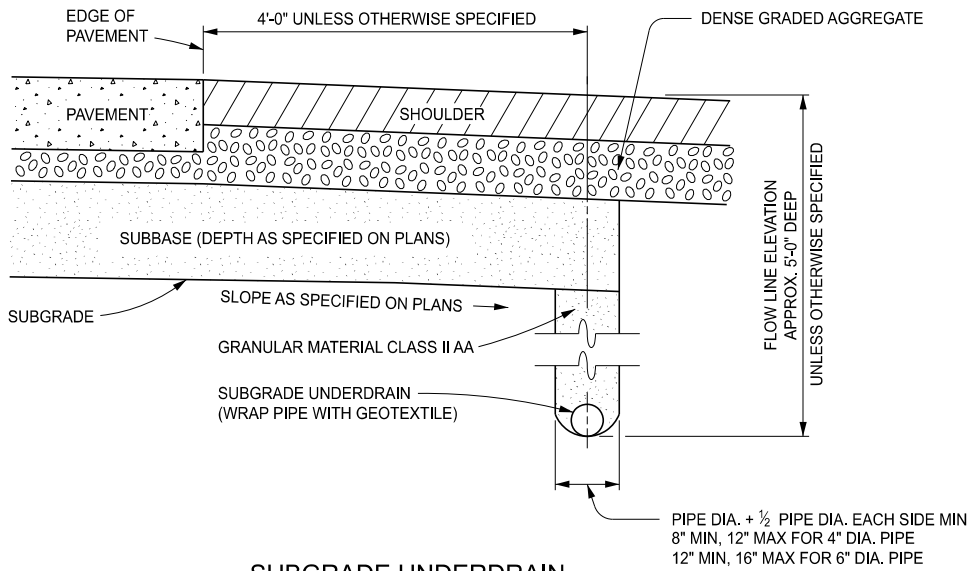
MDOT
Michigan Department of Transportation

DEPARTMENT DIRECTOR
BRADLEY C. WIEFERICH, PE

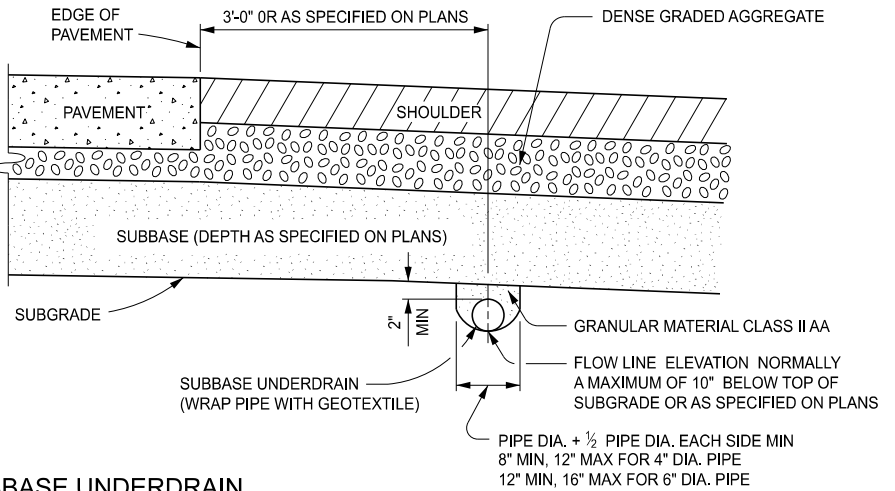
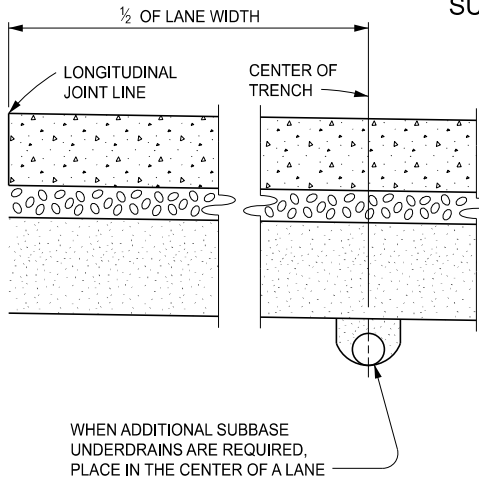
STANDARD PLAN FOR GRANULAR BLANKET, UNDERDRAINS, OUTLET ENDINGS FOR UNDERDRAINS, AND SEWER BULKHEADS			
SPECIAL DETAIL	02/05/2026	R-80-F	SHEET 3 OF 9
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SUBGRADE UNDERDRAIN - OPEN-GRADED

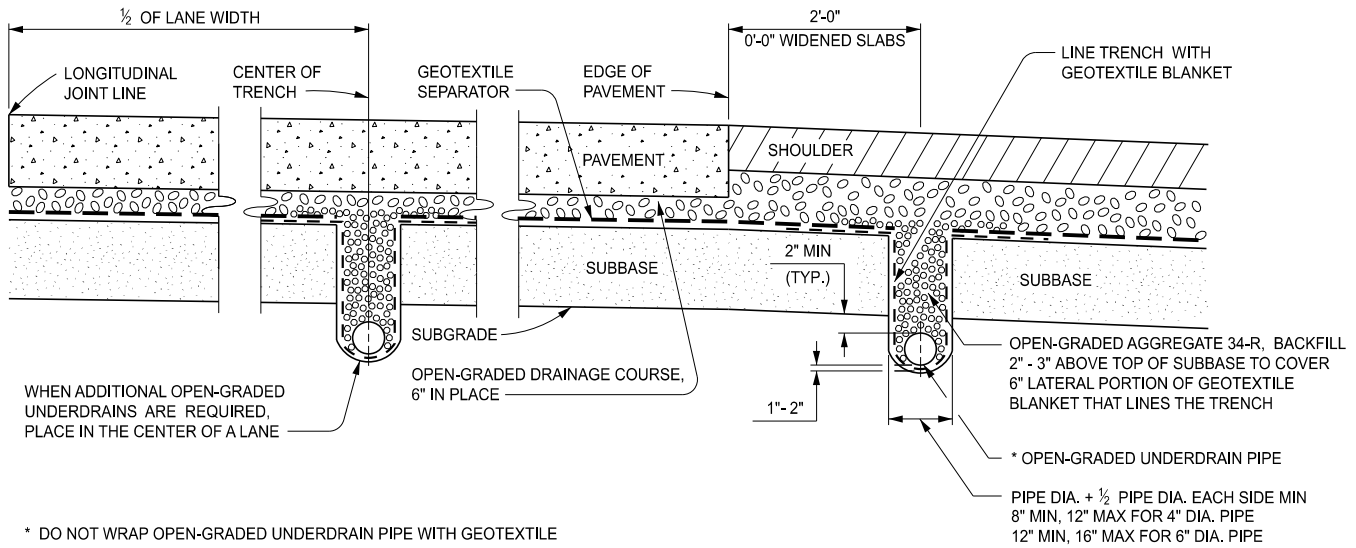


SUBGRADE UNDERDRAIN

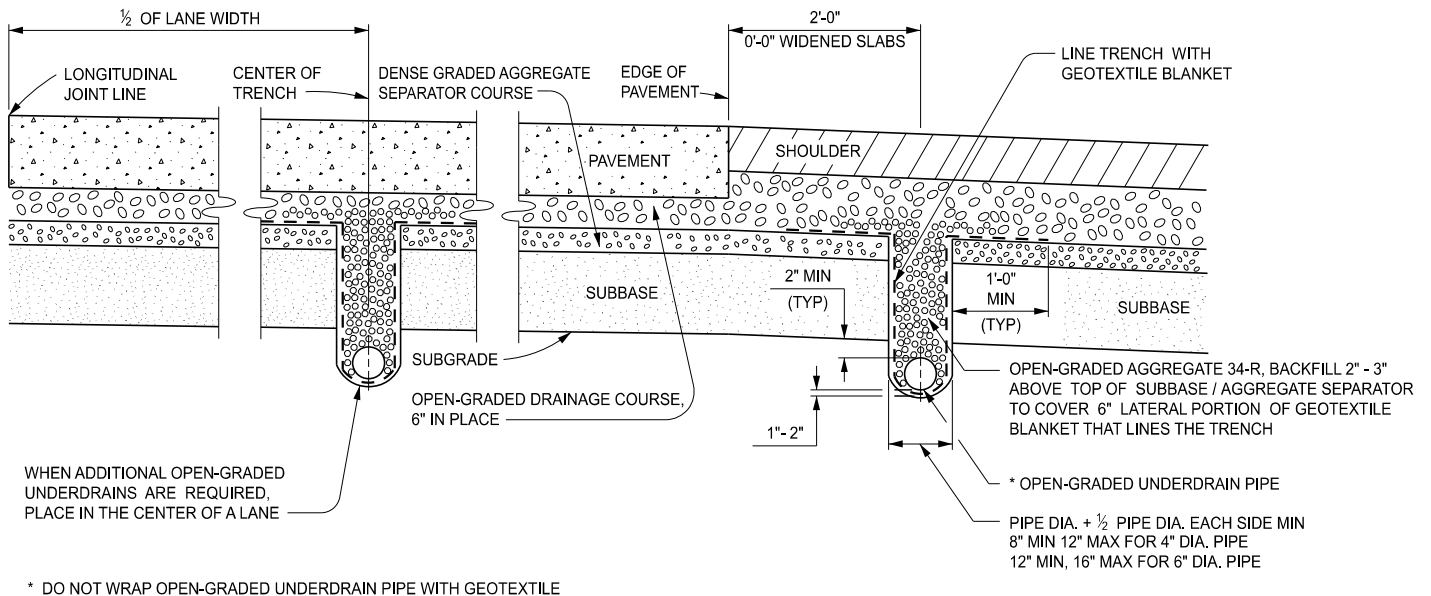


SUBBASE UNDERDRAIN


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	<p>SPECIAL DETAIL FHWA APPROVAL</p>	<p>02/05/2026 PLAN DATE</p>	<p>R-80-F</p>	

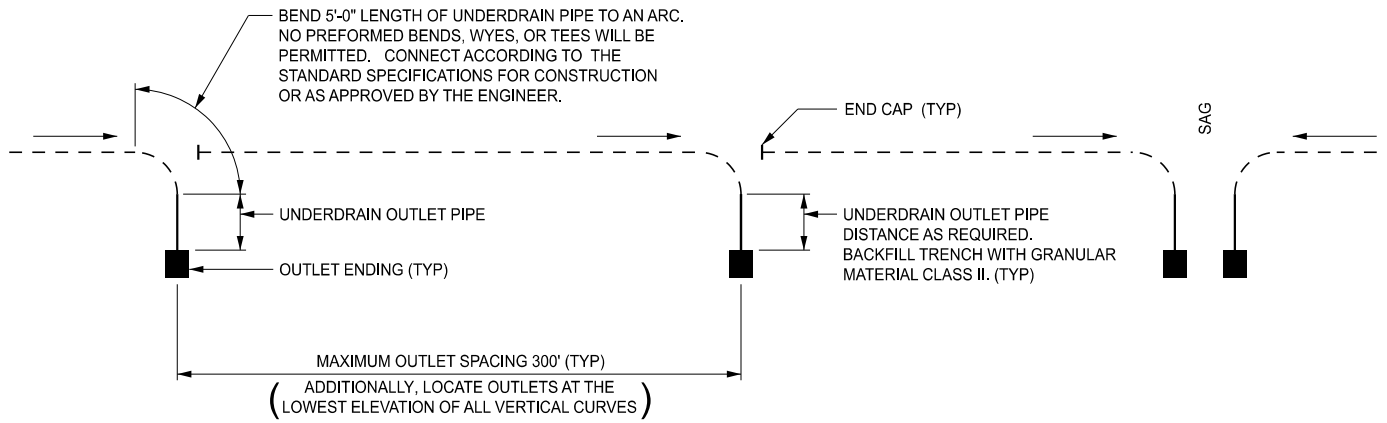


OPEN-GRADED UNDERDRAIN PIPE WITH GEOTEXTILE SEPARATOR

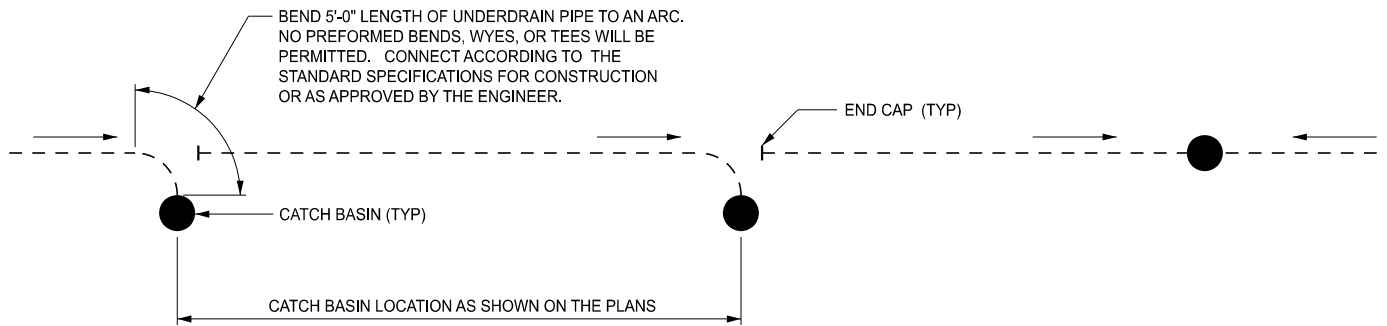


OPEN-GRADED UNDERDRAIN PIPE WITH DENSE GRADED AGGREGATE SEPARATOR COURSE

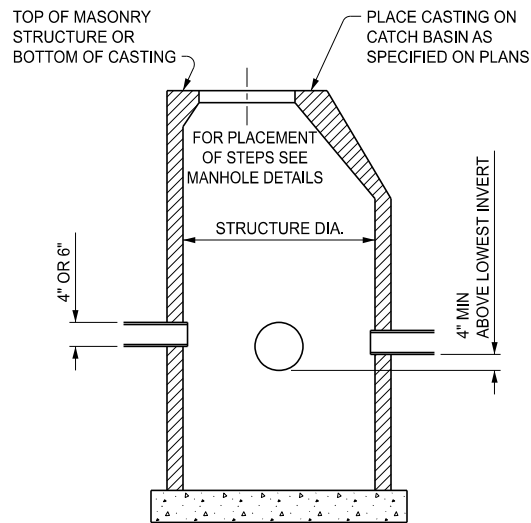
 DEPARTMENT DIRECTOR BRADLEY C. WIEFERICH, PE	STANDARD PLAN FOR GRANULAR BLANKET, UNDERDRAINS, OUTLET ENDINGS FOR UNDERDRAINS, AND SEWER BULKHEADS			SHEET 5 OF 9
	SPECIAL DETAIL FHWA APPROVAL	02/05/2026 PLAN DATE	R-80-F	



PLAN SHOWING OUTLETS FOR UNDERDRAINS



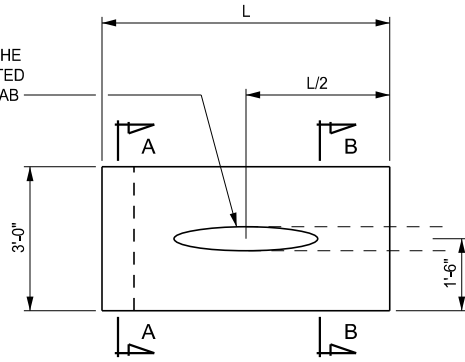
PLAN SHOWING UNDERDRAINS TAPPED INTO CATCH BASINS



PROFILE VIEW

<p>MDOT Michigan Department of Transportation</p> <p>DEPARTMENT DIRECTOR BRADLEY C. WIEFERICH, PE</p>	STANDARD PLAN FOR GRANULAR BLANKET, UNDERDRAINS, OUTLET ENDINGS FOR UNDERDRAINS, AND SEWER BULKHEADS		R-80-F	SHEET 6 OF 9
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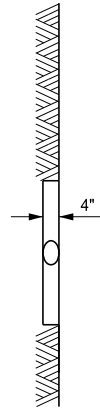
ENSURE THE CENTER OF THE
OUTLET OPENING IS LOCATED
AT THE CENTER OF THE SLAB



PLAN VIEW
SINGLE OUTLET



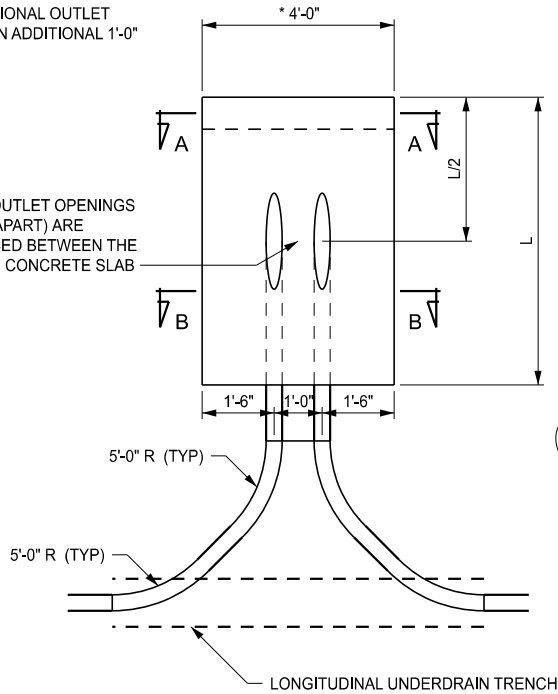
SECTION A - A



SECTION B - B

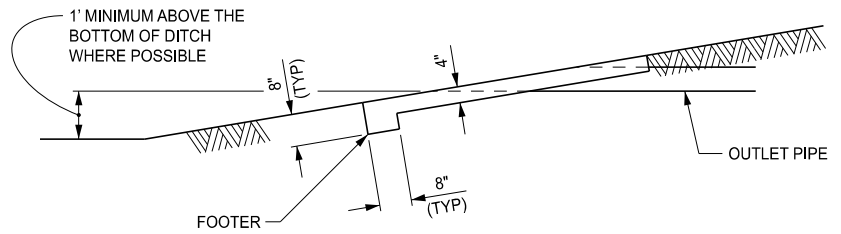
* EVERY ADDITIONAL OUTLET
REQUIRES AN ADDITIONAL 1'-0"

ENSURE THE OUTLET OPENINGS
(SPACED 1'-0" APART) ARE
EQUALLY SPACED BETWEEN THE
EDGES OF THE CONCRETE SLAB



PLAN VIEW
TWIN OUTLET

SLOPE	LENGTH (L)	CONCRETE (CYD) FOR SINGLE OUTLET	CONCRETE (CYD) FOR TWIN OUTLET	CONCRETE (CYD) FOR EACH ADDITIONAL OUTLET
STEEPER THAN 1:6	4'-0"	0.17	0.23	0.06
1:6 OR FLATTER	6'-0"	0.25	0.33	0.08



TYPICAL SECTION

UNDERDRAIN OUTLET ENDING (CIP)

USE FIBER REINFORCED CONCRETE

NOTES:

PROVIDE POSITIVE DRAINAGE (AS SPECIFIED IN THE STANDARD SPECIFICATIONS FOR CONSTRUCTION) FOR UNDERDRAINS AND UNDERDRAIN OUTLETS.

UNDERDRAIN PIPE SIZES ARE AS SPECIFIED ON THE PLANS.

ENSURE OUTLET CONNECTIONS TO DRAINAGE STRUCTURES ARE ACCORDING TO THE STANDARD SPECIFICATIONS FOR CONSTRUCTION.



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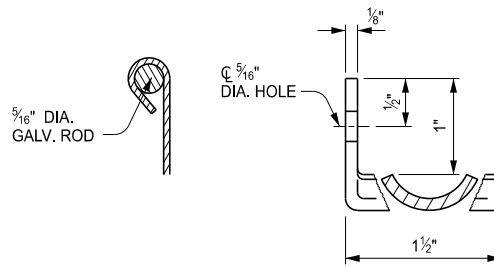
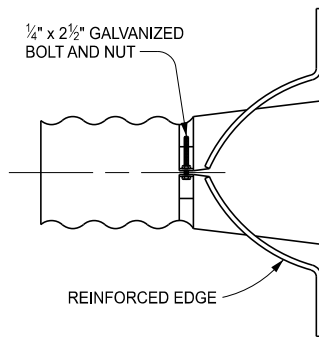
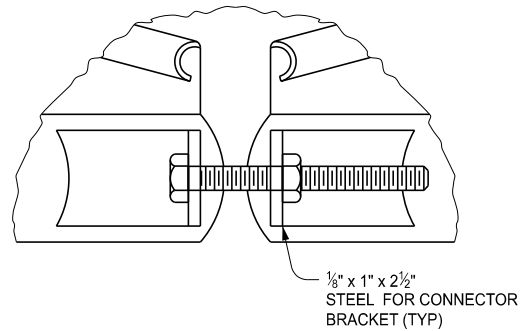
STANDARD PLAN FOR
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SPECIAL DETAIL
FHWA APPROVAL

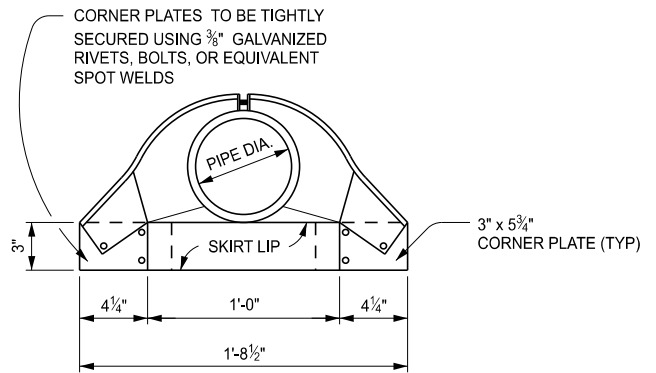
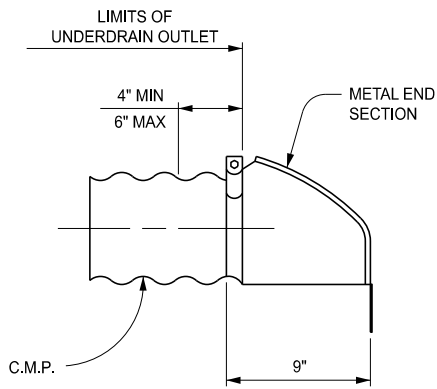
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REINFORCED EDGE DETAIL CONNECTOR BRACKET DETAIL



STEEL END SECTION FOR 4" OR 6" PIPE
 USE ONLY WHEN SITE CONDITIONS WILL NOT ALLOW PROPER
 PLACEMENT OF UNDERDRAIN OUTLET ENDING (CIP).
 HOWEVER, DO NOT USE ON PVC OUTLET PIPE. SEE NOTES.



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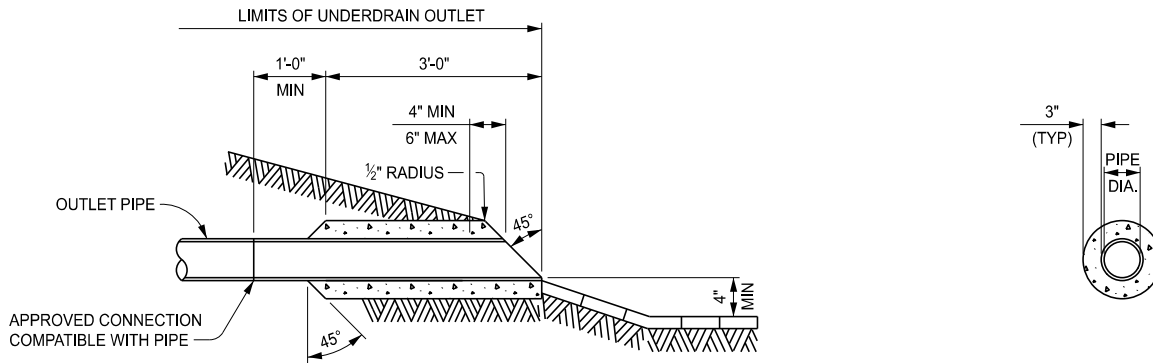
STANDARD PLAN FOR
**GRANULAR BLANKET, UNDERDRAINS, OUTLET ENDINGS
 FOR UNDERDRAINS, AND SEWER BULKHEADS**

SPECIAL DETAIL
 FHWA APPROVAL

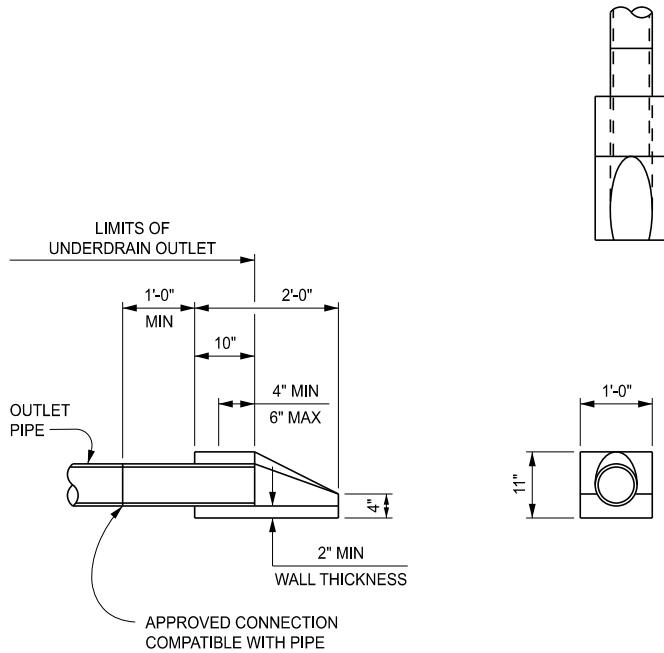
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CONCRETE RING FOR 4" OR 6" PIPE
 USE ONLY WHEN SITE CONDITIONS WILL NOT ALLOW PROPER
 PLACEMENT OF UNDERDRAIN OUTLET ENDING (CIP)



**CONCRETE END SECTION
 FOR 4" OR 6" PIPE**
 USE ONLY WHEN SITE CONDITIONS WILL NOT ALLOW PROPER
 PLACEMENT OF UNDERDRAIN OUTLET ENDING (CIP)

NOTES:

- PROVIDE POSITIVE DRAINAGE FOR UNDERDRAINS AND UNDERDRAIN OUTLETS.
- ENSURE UNDERDRAIN PIPE SIZES ARE AS SPECIFIED ON THE PLAN.
- CONSTRUCT CONNECTIONS BETWEEN UNDERDRAIN PIPE AND UNDERDRAIN OUTLET PIPE ACCORDING TO THE STANDARD SPECIFICATIONS FOR CONSTRUCTION AND AS APPROVED BY THE ENGINEER.
- ENSURE CONNECTIONS, IF REQUIRED WITHIN THE OUTLET PIPE, ARE ACCORDING TO APPLICABLE ASTM SPECIFICATIONS REFERENCED IN THE STANDARD SPECIFICATIONS FOR CONSTRUCTION, ARE WATER TIGHT, AND OF THE SAME MATERIAL AS THE OUTLET PIPE.
- ENSURE OUTLET CONNECTIONS TO DRAINAGE STRUCTURES ARE ACCORDING TO THE STANDARD SPECIFICATIONS FOR CONSTRUCTION FOR DRAINAGE STRUCTURES.
- USE ONLY RIGID PVC OR CORRUGATED METAL FOR UNDERDRAIN OUTLET PIPE .
- CAST THE CONCRETE RING OR CONCRETE END SECTION AROUND THE SAME TYPE OF PIPE THAT IS USED FOR UNDERDRAIN OUTLET PIPE.
- ATTACH STEEL END SECTIONS TO THE ENDS OF CORRUGATED METAL PIPE AS SPECIFIED ON THIS STANDARD PLAN, BY STANDARD METAL BANDS OR BY OTHER CONNECTING DEVICES AS APPROVED BY THE ENGINEER.
- DO NOT USE STEEL END SECTIONS ON PVC OUTLET PIPE. USE CONCRETE SECTIONS.
- REROLL THE ENDS OF HELICALLY CORRUGATED PIPE (EXCEPT PERFORATED PIPE) TO FORM ANNULAR CORRUGATIONS FOR CONNECTING THE END SECTION.
- DO NOT USE GRANULAR MATERIAL PRODUCED FROM CRUSHED PORTLAND CEMENT CONCRETE FOR ANY BACKFILL MATERIAL.



DEPARTMENT DIRECTOR
 BRADLEY C. WIEFERICH, PE

STANDARD PLAN FOR
**GRANULAR BLANKET, UNDERDRAINS, OUTLET ENDINGS
 FOR UNDERDRAINS, AND SEWER BULKHEADS**

(SPECIAL DETAIL) 02/05/2026
 FHWA APPROVAL PLAN DATE

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